Gina Harrison

EX PARTE OR LATE FILED

PACIFIC TELESIS
Group-Washington

March 19, 1996

DOCKET FILE COPY ORIGINAL

EX PARTE

William F. Caton
Acting Secretary
Federal Communications Commission
Mail Stop 1170
1919 M Street, N.W., Room 222
Washington, DC 20554

Dear Mr. Caton:

Re: CC Docket No. 94-54, Equal Access and Interconnection Pertaining to Commercial Mobile Radio Services

Yesterday, Steve V. Sidore, Director, Network Engineering for Pacific Bell Mobile Services, Joseph Rose, Intern, Pacific Telesis, Federal Regulatory Group, Jerry A. Hausman, MacDonald Professor of Economics at Massachusetts Institute of Technology, George Y. Wheeler of Koteen & Naftalin, representing American Portable Telecommunications, Robert R. Cohen, Esq., Issues Manager, Personal Communications Industry Association, and I met to discuss the issues summarized in the attachments with: Walter Strack, Zendi Nakazawa, and Brett Tarnutzer of the Wireless Telecommunications Bureau, Barbara Esbin, Special Counsel, Commercial Radio Division, Jim Coltharp, Chief Economist, Wireless Telecommunications Bureau; and Joseph Farrell, Chief Economist, Office of Plans and Policy.

Messrs. Sidore, Rose, Hausman, Wheeler, and Robert L. Hoggarth, Esq., Director, Regulatory Relations, Personal Communications Industry Association and I met on these same issues with: Katherine O'Brien, Attorney, Daniel F. Grosh, Attorney Advisor, Michael Wack, Deputy Chief, Jeffrey Steinberg, Attorney, Policy Division, Wireless Telecommunications Bureau; Thomas Spavins and Doron Fertig, Competition Division, Office of General Counsel; Greg Rosston, Deputy Chief, Office of Plans and Policy; and Mark Uretsky, Chief Economist, Common Carrier Bureau.

Please associate the attachments with the above-referenced docket. We are submitting two copies of this notice in accordance with Section 1.1206(a)(1) of the Commission's rules.

Please stamp and return the provided copy to confirm your receipt. Please contact me should you have any questions or require additional information concerning this matter.

Sincerely,

Gina Harrison

Attachments: 3

cc: Jim Coltharp
Barbara Esbin
Joseph Farrell
Doron Fertig
Daniel F. Grosh
Zendi Nakazawa
Katherine O'Brien
Gregory Rosston
Thomas Spavins
Jeffrey Steinberg
Walt Strack
Brett Tarnutzer
Mark Uretsky
Michael Wack

Statement of Jerry A. Hausman

I. Response to Economists Incorporated

1. Economists Incorporated (EI) state that a roaming requirement for a transitional period for PCS as proposed by Pacific Telesis in unnecessary. EI claim instead that a PCS provider could sign a contract with a cellular carrier which has roaming capability because the FCC requires cellular carriers to provide roaming to cellular subscribers. This claim is not correct because a roaming contract is specific to a given carrier and does not permit a multi-party roaming arrangement. EI claims that the PCS provider would become a party to the roaming agreement with all other cellular carriers which is not how the actual contracts are written. The EI proposal also does not make economic sense because it leads to significant extra transaction costs as I explain below.

2. EI state (p. 2) that the PCS subscribers could be treated as cellular subscribers outside of their home area. However, numerous extra agreements between companies would be required to determine how to treat the PCS customers, and there would also need to be extra billing runs sorting out which customer used which minutes of roaming. EI never analyze the extra costs which their proposal would create, even if it were permissible under roaming contracts. Thus, the EI approach, even if permissible, would create extra economic costs for PCS providers which would place them at a competitive disadvantage to cellular carriers because of regulatory asymmetric treatment. Just as cellular carriers have the ability to provide roaming to their customers outside their home territory, PCS providers should be able to provide a similar roaming service, especially since it will not create any additional costs for the cellular system which provides the roaming service as I explained in my initial statement (July 10, 1995).

3. In the earlier statement I proposed a transitional roaming requirement for cellular operators similar to their current requirement for other cellular systems. The requirement would be designed to impose no increase in costs on cellular operators. The requirement would be pro-competitive and will increase consumer welfare because PCS subscribers will be able to roam throughout the U.S.

4. Roaming is very different from resale because roaming takes place in territories where a facilities based carrier does not provide service and cannot provide service because it does now have a license in the "foreign" territory. Roaming agreements would be used by facilities based PCS providers who had built out their own territories, but whose customers desired service in other geographical territories. This out of region PCS service may not be initially available for reasons which I discussed in my original statement--mainly the lack of a nationwide standard for PCS technology. A transitional roaming requirement would solve this problem. Resellers, on the other hand, do not build networks for CMRS, but instead they market other providers services within a given territory. I discuss the economic differences between roaming and resale further in Section II of this statement.

5. EI make two fundamental economic mistakes with their claim that the same two carriers must exist in <u>each market</u> before competitive problems could arise. Thus, the identical carriers would need to provide service in say both San Francisco and Chicago before a competitive problem would arise, according to EI. However, note that even if one carrier refuses service, the PCS provider is then left to bargain with the remaining cellular provider which will be in a monopoly bargaining position, until compatible PCS systems are operating. Bargaining with a firm in a monopoly position is the antithesis of competition. The firm in the monopoly position will be unregulated and the PCS carrier has no recourse to arbitration. The second mistake EI makes is to consider only the situation where the same two cellular carriers are present.

Consideration only of "matched pairs" (EI, pp. 2-3) omits all the non-matched pairs where each carrier has an economic incentive to deny roaming service for reasons I gave in my previous affidavit. Thus, a given cellular carrier may be in New York and decide not to provide roaming to a PCS provider's customers from San Francisco because they compete there while the other cellular firm in New York may face competition in Los Angeles (a different MSA). The two firms do not have two agree (conspire) to deny service; they both merely need to find it in their economic interest unilaterally to do so given the expected action of the other cellular firm. Each firm may well decide not to provide roaming to the San Francisco PCS providers customers because it will make PCS less attractive, and the cellular firm can expect the other cellular firm to come to the same conclusion without any need for an agreement since the economic incentives are similar. Note that this situation exists in almost all of the top 30 markets. Thus, all the various combinations across markets must be considered to analyze the economic incentives of cellular carriers.

6. I agree with EI (p. 3) that PCS networks will find it profitable to offer roaming arrangements once their networks are constructed. However, the transitional problem of compatible PCS systems remains. Thus, it is this market failure of incompatible PCS systems which I identified in my original affidavit (¶ 15) as the primary cause of the need for a transitional roaming rule. EI ignore this cause of market failure and attempt to focus only on market power causes of market failure. Network incompatibility problems are likely to be an important cause of market failure.

7. EI attempt to claim that the problem is "ephemeral" (p. 9) They point to the Sprint Telecommunications Venture which plans to build a nationwide PCS network. However, they ignore the <u>current</u> effect on competition where PCS is operating in Washington, and the cellular providers are advertising the competitive disadvantage of lack of roaming capability of the system. Thus, the market has already demonstrated what EI deny--the

inability of PCS to roam in its initial states unless cellular provides roaming capability. The problem is not "ephemeral"--it exists in Washington today and it will soon exist in California where PacTel will turn on its systems this year.

8. EI claim that a roaming requirement would impose costs on cellular carriers by forcing them to expand capacities to supply roaming demand which may only be temporary. (p. 10) EI forget to note that cellular has been growing at 40% per year and is expected to continue this growth rate. Thus, taking the most extreme case where PCS would be 50% as large as cellular during the transition period and have similar roaming minutes (about 10% or 13.6% of revenues), even if <u>every</u> PCS provider stopped roaming at the same instant, which would never actually happen, the growth of cellular would replace the lost minutes in 1-2 months.[1] This period of time could hardly affect the cellular network expansion process given its inherently lumpy nature, nor would it cause costs to the cellular provider. Note that current cellular companies, e.g. AT&T, will have an incentive to shift their current cellular customers when they roam to PCS as well once they have PCS operating so that AT&T will receive the incremental roaming revenue, yet EI do not call for an end to cellular roaming requirements. Thus, no subsidies will exist under my plan which calls for PCS providers to pay for the roaming capacity that is used.

9. Lastly, EI claim that a "chilling effect" on investments could occur (p. 11). The market entry decisions have already been made for the majority of PCS spectrum so that the roaming requirement would not adversely affect these investments. PCS providers have purchased their spectrum and are obliged to build their networks. Indeed, many PCS providers are already constructing their networks. Thus, competition will not be adversely affected

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[1] More realistic assumptions would decrease this time period to about 1 week or less.

in PCS by a roaming requirement. Indeed, to the extent that PCS is made more attractive to consumers by the ability to roam, PCS providers will have an increased economic incentive to build out their networks more speedily than otherwise. Furthermore, Pacific Telesis will pay for the roaming it uses so that no free riding occurs.

10. The Commission decided not to offer nationwide PCS licenses, a decision which I recommended. However, the lack of a national PCS standard, at least initially, is an outcome of the Commission decision. A network coordination failure is the likely result, and since a nationwide analogue cellular standard exists to solve the problem, I recommend that the Commission utilize the existing cellular networks as a transitional solution. EI have not identified any real costs which the PCS providers will not pay. Since the Commission depended on future PCS Competition to provide competition to cellular, a transitional roaming requirement which allows this competition will increase competition and will be in the public interest.

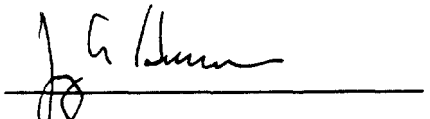
II. Economic Differences Between Roaming and Resale

11. Pacific Telesis has recommended that the Commission extend current roaming rules from cellular providers to PCS providers for a limited period of time. It is important to note the significant economic differences between roaming and resale from a cellular or PCS providers economic standpoint. Roaming allows a facilities-based provider to offer service to its customers outside of its licensed territory. However, all the economic incentives remain in the presence of roaming for a PCS provider to construct its network within its geographical territory in an economical and expeditious manner. To the extent that roaming makes the PCS service more attractive to consumers, roaming will have the effect of increasing the economic incentives for the PCS provider to construct and enlarge its network.

12. Resale is typically done by a non-facilities based provider.[2] A reseller acquires a block of numbers from the facilities based provider in the desired territory. Resellers also are subject to any applicable state regulations relating to resellers. My research in cellular over the years has never found any pro-competitive benefit of resellers in cellular, either in the form of lower prices or greater penetration. I am unaware of any research by others which demonstrates that cellular resale has led to lower prices or greater output. Indeed, my research demonstrates that protection of resellers by the CPUC in California through a mandatory retail margin led to higher cellular prices for consumers.

13. To provide roaming, a facilities based provider must negotiate a roaming agreement with another facilities based provider. This agreement typically provides that the two licensees will allow each other's subscribers to use each other's network in a seamless manner (i.e. without having to give additional information such as a credit card number to initiate a call and to receive calls outside of the home territory) and it also determines how the calls will be billed. Thus, it is a much more desirable method to provide service ubiquity to customers than becoming a reseller in every state in which the facilities based provider would like its customers to have service. Transactions costs and costs of serving customers are considerably less with roaming than if a PCS provider were required to become a reseller in every state outside its territory.

March 18, 1996



Jerry A. Hausman

[2] An exception existed in cellular when a facilities based competitor was allowed to resell its competitor's services for a limited time to mitigate the headstart that the B Block provider had.

Affidavit of Professor Jerry A. Hausman

1. My name is Jerry A. Hausman. I am the MacDonald Professor of Economics at the Massachusetts Institute of Technology in Cambridge, Massachusetts, 02139.

2. I received an A.B. degree from Brown University and a B.Phil. and D. Phil. (Ph.D.) in Economics from Oxford University where I was a Marshall Scholar. My academic and research specialties are econometrics, the use of statistical models and techniques on economic data, and microeconomics, the study of consumer behavior and the behavior of firms. I teach a course in "Competition in Telecommunications" to graduate students in economics and business at MIT each year. Mobile telecommunications, including competitive and technological developments in cellular, PCS, and ESMR are some of the primary topics covered in the course. I was a member of the editorial board of the Rand (formerly the Bell) Journal of Economics for the past 13 years. The Rand Journal is the leading economics journal of applied microeconomics and regulation. In December 1985, I received the John Bates Clark Award of the American Economic Association for the most "significant contributions to economics" by an economist under forty years of age. I have received numerous other academic and economic society awards. My curriculum vitae is attached.

3. I have done significant amounts of research in the telecommunications industry. My first experience in this area was in 1969 when I studied the Alaskan telephone system for the Army Corps of Engineers. Since that time, I have studied the demand for local measured service, the demand for intrastate toll service, consumer demands for new types of telecommunications technologies, marginal costs of local service, costs and benefits of different types of local services, including the effect of higher access fees on consumer welfare, demand and prices in the cellular telephone industry, and

consumer demands for new types of pricing options for long distance service. I have also studied the effects of new entry on competition in paging markets, telecommunications equipment markets, exchange access markets, and interexchange markets and have published a number of papers in academic journals about telecommunications. Lastly, I have also edited two recent books, Future Competition in Telecommunications (Harvard Business School Press, 1989) and Globalization, Technology, and Competition in Telecommunications (Harvard Business School Press, 1993).

4. I have been involved in the mobile telecommunications industry since 1984. I participated in PacTel's purchase of Communications Industries in 1985 and have provided testimony on previous occasions on cellular competition and regulation to state PUCs and to the FCC. I previously submitted testimony to the FCC on questions of cellular regulation, including the question of whether cellular companies should be allowed to bundle cellular CPE with cellular service, whether the FCC should forbear from regulation of mobile service providers, whether the FCC should require equal access obligations on CMRS providers, and whether the FCC should preempt state regulation of cellular. During the PCS proceedings I have filed 6 affidavits which considered eligibility questions for LECs, the presence of economies of scale and scope in providing PCS, the design of an appropriate auction framework for PCS spectrum, spectrum allocation and band size, eligibility for in-region cellular companies, and the appropriate framework for pioneer preferences. I spoke at the FCC Task Force meeting on PCS held on April 11, 1994. I also have done significant academic research in mobile telecommunications and it is one of the primary topics in my graduate course, "Competition in Telecommunications", which I teach each year at MIT.

I. Summary and Conclusions

5. I have been asked by Pacific Telesis Mobile Services (PTMS) to consider the question of whether out of region roaming requirements for wireless carriers would be in the public interest. I conclude that an out of region roaming requirement at non-discriminatory prices would be pro-competitive, would increase consumer welfare and would increase the adoption of PCS.

6. The roaming requirement should be designed so that it imposes no additional costs on wireless carriers. The requirement would impose the same obligation on wireless carriers that currently applies to cellular carriers that they have with respect to other cellular carriers. Thus, the outcome of the requirement will be pro-competitive. The requirement should also exist only for a transitional period. After this transitional period, the requirement should be removed, and market forces will likely lead to an economically efficient outcome.

II. Economic Analysis of Roaming

7. "Roaming" describes the situation when a subscriber of a given Commercial Mobile Radio Service (CMRS) uses the service of another CMRS provider even though the subscriber has no pre-existing service relationship with the "foreign" provider. Roaming has become increasingly important in the cellular industry where about 13.6% of revenues in the last 6 months of 1994 arose from roaming. Growth in roaming revenues has been about 42% per year as roaming has been technically easier for the cellular subscriber to use. Roaming revenues have been growing faster than overall cellular revenues by a statistically significant amount. Incoming calls are now significantly easier to receive in many situation than they were a few years ago. Furthermore, in-progress calls are no longer dropped at service boundaries. Given the essential mobile feature of CMRS, roaming should continue to become increasingly important in the future.

8. CMRS consumers place a high value on the ability to roam. The growth rates described above occurred despite premium prices for roaming on many cellular systems. The majority of cellular customers belong to discount plans on their home cellular systems. These discount plans take a number of forms: (1) customers receive a discount for committing to one year or longer contracts (2) customer receive discounts for plans which have given usage levels (3) customers receive discounts when they subscribe to multiple cellular numbers. However, when cellular subscribers roam to foreign cellular systems, these discounts are typically not in effect. Thus, most customers pay a non-discounted price to roam.

9. Roaming competition has also been an important component of overall cellular competition. For example, roaming is quite heavy in the Northeast corridor, i.e. the Boston-Washington region. Until about 2 years ago the standard roaming fee was $3 per day plus the undiscounted price per minute of use (or even higher). The Block A carrier in Boston and Washington eliminated the $3 per day charge for roaming. The Block A carrier gained significant market share in Boston after making this change. Subsequently, the Block B carrier in Boston also eliminated the daily roaming charge. This form of price competition directly benefits consumers and leads to greater spectrum usage through high cellular demand.

III. The Likely Importance of Roaming on Cellular Systems for PCS

10. PCS will begin operation in 1996. It is likely that PCS operators will adopt different technologies. I expect that GSM, currently used in the UK, Germany, Australia, and a number of other counties, will be a widely used technology. However, no guarantee exists that it will be adopted in every PCS MTA. Indeed, I consider this outcome to be unlikely since numerous PCS licensees currently operate cellular networks in other regions and are likely to adopt TDMA or CDMA technology to be compatible with their existing cellular systems. Thus, it is unlikely that a single technology will exist nationwide

for PCS at the beginning of its operation.

11. However, a single nationwide CMRS technology will exist over the next five years, the cellular technology currently in use on the two cellular blocks. Thus, a dual mode mobile telephone which can operate on digital PCS and on cellular will be able to provide nationwide roaming. A PCS customer who wants to roam would be able to buy a dual mode phone and use PCS in a home region, and other PCS MTAs which adopt the same technology, and use cellular roaming in incompatible technology PCS MTAs.

12. Roaming is extremely rapidly growing with about 14% of cellular revenues arising from roaming. Roaming is likely to be even more important for PCS. PCS will have very lightweight and long lasting battery mobile handsets which will make it more convenient to carry the handset at all times (future cellular handsets will also have these features). I also expect the price of mobile calls to decrease with the inception of PCS for reasons that I have discussed in previous affidavits to the FCC. These lower prices will cause consumers to make more use of CMRS and could cause consumers to adopt the use of cellular and PCS as their overall "personal" phone numbers. With these changes in technology and in prices, I expect that roaming will continue to become increasing important in the overall usage of mobile voice services.

IV. Transitional Rules for Roaming Will Be in the Public Interest

13. An FCC requirement that cellular and PCS licensees provide the same functionality to PCS roaming that cellular operators provide to cellular roaming today under the same terms and conditions will be pro-competitive and will lead to increased consumer welfare. PCS demand for roaming is likely to be quite strong, and it is unlikely that nationwide availability of non-cellular PCS roaming will exist during the startup phase of PCS. Thus, CMRS competition will be advanced if new PCS operators can provide roaming which is currently available to cellular operators. PCS customers will also value the

ability to roam into other regions, much as cellular customers do today.

14. However, in imposing this regulation it is important that the costs of cellular providers are not increased by this requirement. Thus, the PCS subscriber should be required to have a dual mode handset which is transparently similar to a roaming cellular handset to the cellular operator. In this situation where costs of cellular and PCS roaming would be the same, cellular operators could offer the same roaming terms with no loss in net revenues. Overall demand and consumer welfare would increase with no financial burden placed on existing cellular operators. The outcome will be pro-competitive and will lead to increased consumer welfare.

15. The immediate question to an economist (at least an economist such as myself) is what is the source of potential market failure which creates this regulatory requirement? The potential market failure arises from two sources. First, in the early stages of PCS it is unlikely that a single technology will be adopted in each MTA. Thus, parts of the country will exist in which a given PCS technology will not exist. I expect this problem to become less important over time as experience is gained with PCS technologies, PCS technology consortia are formed (as has happened in cellular), and the smaller 10 MHz BTA blocks are auctioned which will increase technology diversity in a given region. Thus, the first source of potential (transitory) market failure is the limited spectrum blocks available for PCS at the current time and the startup nature of PCS.

16. Second, some current cellular operators may find it in their economic interest not to provide roaming to certain PCS operators. For example, suppose that a current cellular operator attempts to limit competition from PCS in its region. The cellular operator could deny roaming or charge higher roaming prices in its other regions to put the new PCS services at a competitive disadvantage. A number of large (top 30) cellular

MSAs exist where both cellular carriers also control both blocks in a different MSA so that unilateral economic actions could lead to this outcome.

17. Dr. Bruce Owen, who submitted an affidavit on behalf of AT&T/McCaw claims that because two cellular system exist in each area, current cellular providers would not find it in their economic best interest to deny roaming or charge higher roaming prices to their new PCS rivals in other regions (Owen aff., June 14, 1995, ¶ 62). However, he apparently has not investigated the current allocation of cellular MSAs which makes this outcome quite possible. Each cellular operator may find it to be economically beneficial to deny roaming or to charge higher prices for roaming in certain cellular MSAs to make PCS less desireable to consumers who place a high value on roaming.

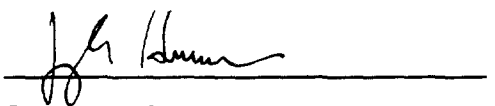
18. Dr. Owen raises three argument against the requirement for cellular systems to include provision of roaming to PCS, similar to the current provision that requires cellular operators to provide roaming service to subscribers of other cellular systems. First, he states that roaming may not be technically feasible or it may lead to costs which exceed its value. (¶ 64) Under my proposal of technically transparent roaming, all technical obligations will fall on the PCS provider, not on the current cellular providers. Thus, technical feasibility and cost will not be an issue. Second, Dr. Owen states that a roaming requirement would reduce the demand for roaming services from non-cellular systems. Thus, he claims roaming obligations could create delay in the deployment of non-cellular systems. (¶ 65) This argument is incorrect because competition will cause the economically efficient buildout of PCS networks. Dr. Owen's claim is similar to the statement that a quota will lead to faster expansion of new industries in developing economies. The statement is correct, but it ignores the loss in competition and economic efficiency which harm consumers. Lastly, Dr. Owen restates his claim that no incentive exists for cellular systems to deny roaming services. (¶ 66) He bases this claim on the foregone profit

opportunities from offering roaming services. However, he fails to consider the increase in revenue that a cellular provider would gain in a region if PCS is made less attractive by its inability to provide out of region roaming services.

V. Conclusion

19. I am proposing a transitional roaming requirement for cellular operators similar to their current requirement for other cellular systems. The requirement should be designed to impose no increase in costs on cellular operators. The requirement will be pro-competitive and will increase consumer welfare because PCS subscribers will be able to roam throughout the U.S.

I declare under penalty of perjury that the foregoing is true and correct. Executed on July 10, 1995.



Jerry A. Hausman
MacDonald Professor of Economics
MIT Cambridge, MA

THE COMMISSION SHOULD ADOPT A ROAMING RULE

Pacific Bell Mobile Services
March, 1996

A Broad Roaming Policy Should Be Adopted.

PACIFIC BELL® Mobile Services

- The existing rule 22.901 should be extended to PCS providers.
- In addition, the Commission should mandate that roaming be made available on fair and nondiscriminatory terms and conditions.
- This is consistent with Sections 201 and 202 of the Communications Act.

The Telecommunications Act of 1996 Supports Commission Action on Roaming.

PACIFIC BELL® Mobile Services

- Section 251(a) "Each telecommunications carrier has the duty --
- (1) to interconnect directly or indirectly with the facilities and equipment of other telecommunications carriers;....'
- But without a clear statement with a respect to the roaming obligation, carriers may be forced to resort to a Section 208 complaint.

Roaming Scenario 1 - Originating Call Only

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Mobile Services

Subscriber's Capability - Roaming subscribers are only allowed to originate calls.

Contract Arrangements:

- The subscribers' home network and visited network must have agreements on the terms and conditions to compensate one another for network usage.
- The exchange of billing information becomes part of the billing settlements process.

Technology Requirements:

- The only technical requirement is that the subscribers' handset has an air interface compatible with the visited network.
- This may require a dual mode handset. **Dual mode handset availability (i.e. AMPS/PCS1900) is scheduled for 2Q 1997.**

Technical requirements are no different than used by cellular today

Roaming Scenario 1 Originating Calls Only

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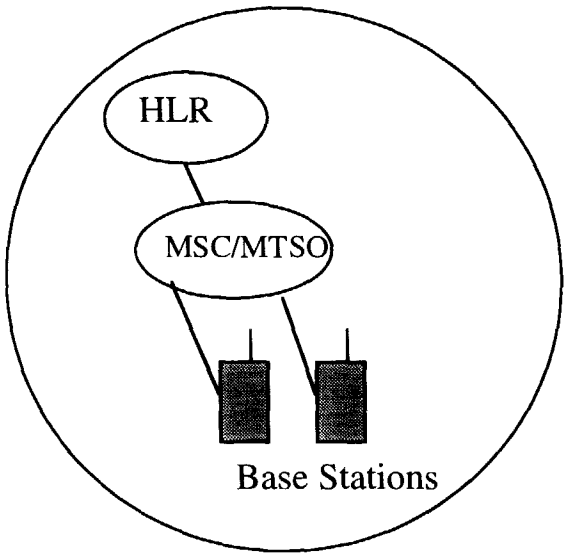
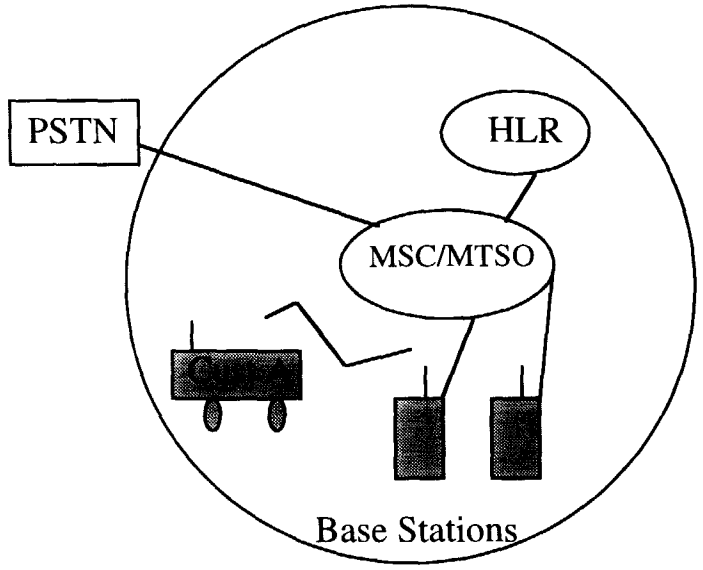
Mobile Services



Network A



Network B

No CMRS to CMRS interconnection Required

Roaming Scenario 2 - Originating and Terminating Calls, Same Network Technology

PACIFIC BELL® Mobile Services

Subscriber's Capability - Roaming subscribers can originate calls and have calls delivered to them.

Contract Arrangements: Same as Scenario 1.

Technology Requirements:

- The subscribers' handset has the same requirements as Scenario 1.
- To enable roaming subscribers to receive calls their home network must be updated with the identification of the visited MSC/MTSO.
- Home Location Registration (HLR) for full roaming can be accomplished via several mechanisms which cellular uses today (i.e. IS-41, X.25, SS7).
- Call completion to the roaming subscriber is handled no differently than cellular today via the PSTN to the visited network.

Technical requirements are no different than used by Cellular today

Roaming Scenario 2 - Originating & Terminating Calls Same Network Technology

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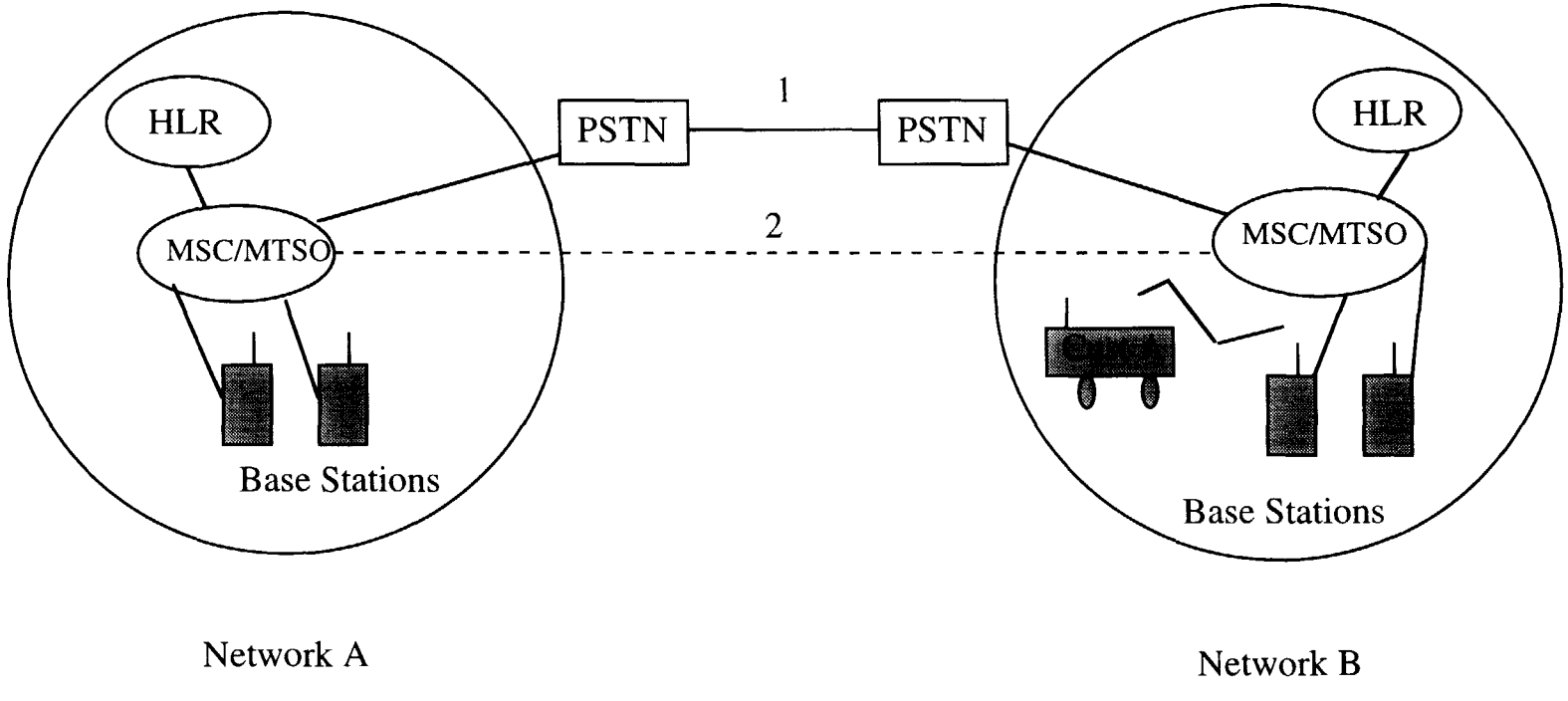
Mobile Services



1. Terminating calls are delivered via the PSTN.
2. Signaling information exchange via an available national signaling network.

Roaming Scenario 3 - Originating and Terminating Calls, Different Network Technology

PACIFIC BELL® Mobile Services

Subscriber's Capability - Roaming subscribers can originate calls and have calls delivered to them.

Contract Arrangements: Same as Scenario 1.

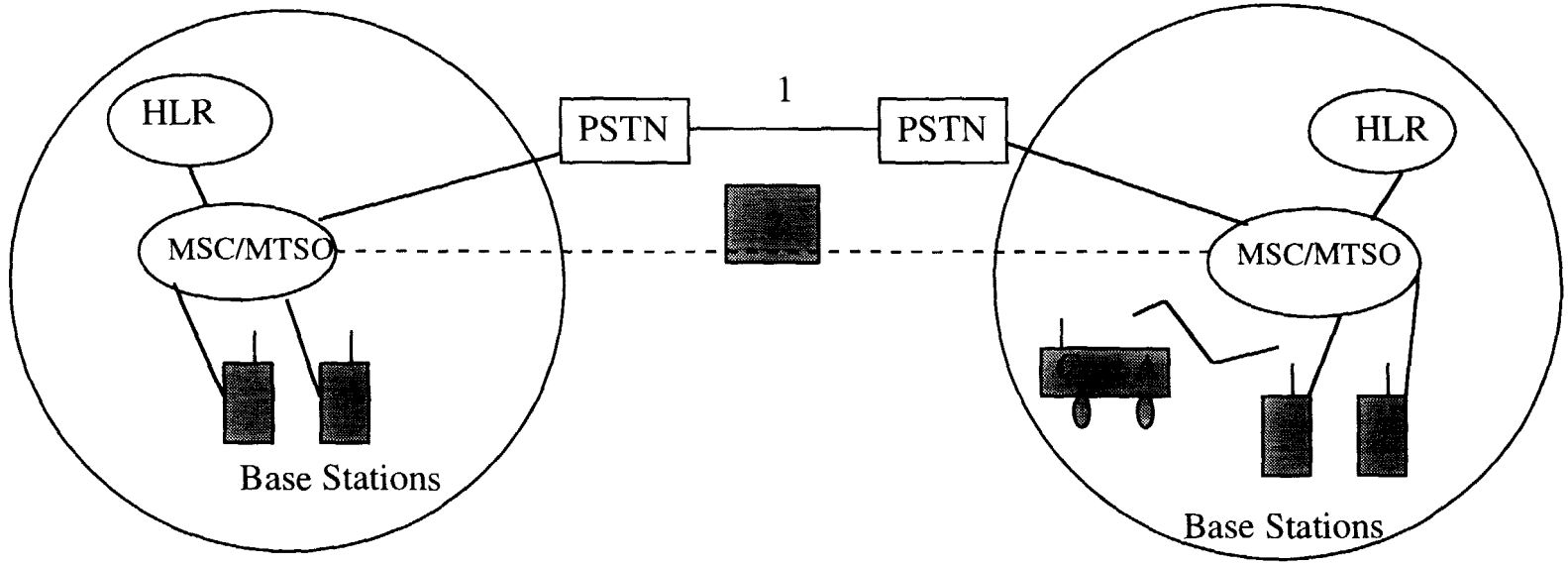
Technology Requirements:

- The subscribers' handset has the same requirements as Scenario 1.
- The subscribers' home network is updated the same way as identified in Scenario 2.
- Call completion to the roaming subscriber is the same as Scenario 2
- Protocol conversion will be needed to allow two networks with different technologies (i.e. PCS1900 and AMPS/IS41) to exchange network information messages.
- **An AMPS/TDMA dual mode handset is available today.**
- **An AMPS/PCS1900 dual mode handset is scheduled for 2Q 1997.**
- **An IS-41/PCS1900 protocol converter is scheduled for 4Q 1996.**

Technical requirements are no different than used by Cellular today

Roaming Scenario 3 - Originating & Terminating Calls Different Network Technology

PACIFIC BELL® Mobile Services



Network A

Network B

1. Terminating calls are delivered via the PSTN.
2. Signaling information exchange via an available national signaling network with a protocol converter.